## CLAIMS

What is claimed is:

1. Optical pumping unit comprising

a first pump source adapted to emit a first pump radiation at wavelength $\lambda p1$;

a second pump source adapted to emit a second pump radiation at wavelength $\lambda p2$, with the wavelength $\lambda p2$ different from the wavelength $\lambda p1$; and

a common coupling section comprising

a first and a second port connected to the first and second pump source for respectively receiving the first and the second pump radiation;

a third port for a signal radiation at wavelength $\lambda s$; and

a fourth port;

wherein said coupling section is adapted to combine, in the fourth port, the signal radiation and the first and second pump radiation by means of a reversal of the direction of propagation of the first pump radiation from the first port to the fourth port.

2. Pumping unit according to claim 1, wherein the coupling section also comprises

a first optical path which connects the first and the second port; and

a second optical path, in communication with the first optical path, which connects the third and the fourth port,

and it is adapted to send to the fourth port the first pump radiation, which propagates along the first optical path from the first port to the second port, making it pass from the first optical path to the second optical path and reflecting it back towards the fourth port .

3. Pumping unit according to claim 2, wherein the coupling section is also adapted to send to the fourth port the second pump radiation, which propagates along the first optical path from the second port towards the first port, making it pass from the first optical path to the second optical path.

4. Pumping unit according to claim 2, wherein the coupling section is also adapted to let the signal radiation propagate along the second optical path.

5. Pumping unit according to claim 1, wherein said coupling section comprises an optical reflection element adapted to reflect the first pump radiation at wavelength $\lambda p1$ towards the fourth port, and to let the second pump radiation at wavelength $\lambda p2$ and the signal radiation at wavelength $\lambda s$ pass.

6. Optical pumping unit according to claim 5, wherein said optical reflection element is a Bragg grating.

7. Optical pumping unit according to claim 2, wherein the first optical path comprises a waveguide.

8. Optical pumping unit according to claim 7, wherein the second optical path comprises a waveguide.

9. Optical pumping unit according to claim 8, wherein the first and the second optical path are coupled along a coupling area.

10. Optical pumping unit according to claim 9, wherein the coupling area is such as to let substantially all the power of the signal radiation at wavelength $\lambda s$ propagate along the second optical path, and to let substantially all the power of the first pump radiation at wavelength $\lambda p1$ and substantially all the power of the second pump radiation at wavelength $\lambda p2$ pass from the first optical path to the second optical path.

11. Optical pumping unit according to claim 10, wherein the first and the second optical path form a WDM optical coupler of the $100\%\lambda p1,\lambda p2/0\%\lambda s$ type, comprising two waveguides coupled with one another in said coupling area.

12. Optical pumping unit according to claim 10, wherein said coupling section comprises an optical reflection element positioned in the coupling area of the first and the second optical path, adapted to reflect the first pump radiation at wavelength $\lambda p1$ towards the fourth port and to let the second pump radiation at $\lambda p2$ and the signal radiation at wavelength $\lambda s$ pass.

13. Optical pumping unit according to claim 12 wherein said optical reflection element is a Bragg grating.

14. Optical pumping unit according to claim 12, wherein said optical reflection element is positioned in a point of the coupling area at which about 50% of power of the first pump radiation passes from the first optical path to the second optical path.

15. Optical pumping unit according to claim 9, wherein the first and the second optical path are also coupled along a second coupling area.

16. Optical pumping unit according to claim 15, wherein the first and the second optical path comprise an input coupler, an output coupler, an upper arm and a lower arm, and wherein the input coupler has four ports of which two are the second and the third port of the coupling section, and two are in communication with the upper arm and the lower arm, and the output coupler has four ports of which two are the first and the fourth port of the coupling section, and two are in communication with the upper arm and the lower arm .

17. Optical pumping unit according to claim 5, wherein the coupling section also comprises a second optical reflection element adapted to reflect the first pump radiation at wavelength $\lambda p1$ towards the fourth port, and to let the second pump radiation at wavelength $\lambda p2$ and the signal radiation at wavelength $\lambda s$ pass.

18. Optical pumping unit according to claim 17, wherein the first and the second optical path comprise an input coupler, an output coupler, an upper arm and a lower arm, and wherein the input coupler has four ports of which two are the second and the third port of the coupling section, and two are in communication with the upper arm and the lower arm, and the output coupler has four ports of which two are the first and the fourth port of the coupling section, and two are in communication with the upper arm and the lower arm, and wherein the first optical reflection element is positioned in said upper arm and the second optical reflection element is positioned in said lower arm.

19. Optical pumping unit according to claim 18, wherein the input coupler and the output coupler are two WDM optical couplers of the $50\%\lambda p1,\lambda p2/0\%\lambda s$ type, each comprising two waveguides coupled with one another in said first and said second coupling area.

20. Optical amplifier for amplifying a signal radiation at wavelength $\lambda s$ comprising a dielectric guiding active means and a pumping unit according to any one of claims from 1 to 17, wherein the fourth port of the coupling section is in communication with the active means.

21. Optical communication line comprising a transmission optical fibre length and a pumping unit according to any one of claims from 1 to 17 wherein the fourth port of the coupling section is in communication with said transmission optical fibre length.

22. Optical communication line comprising a transmission optical fibre length and an optical amplifier according to claim 18 in communication with said transmission optical fibre length.

23. Optical communication system comprising

a transmitting station adapted to provide a signal radiation having wavelength λs;

an optical transmission line, optically connected to said transmitting station , for transmitting said signal radiation;

a receiving station, optically connected to said optical transmission line , for receiving said signal radiation;

at least one pumping unit according to any one of claims from 1 to 17 in communication with said optical transmission line .

24. Optical communication system comprising

a transmitting station adapted to provide a signal radiation having wavelength λs;

an optical transmission line, optically connected to said transmitting station , for transmitting said signal radiation;

a receiving station, optically connected to said optical transmission line , for receiving said signal radiation;

at least one optical amplifier (1) according to claim 18 in communication with said optical transmission line.

25. An optical coupling section, for coupling a signal radiation at wavelength λs, a first pump radiation at wavelength λp1 and a second pump radiation at wavelength λp2, comprising

a first and a second port for receiving respectively the first and the second pump radiation;

a third port for the signal radiation; and

a fourth port,

and being adapted to combine the signal radiation and the first and second pump radiation in the fourth port through a reversal of the direction of propagation of the first pump radiation from the first port to the fourth port .

26. Method for coupling a first radiation at wavelength λp1, a second radiation at wavelength λp2 and a third radiation at wavelength λs through a common coupling section having a first and a second side that are opposed to one another, the first side comprising a first and a fourth port and the second side comprising a second and a third port, said method comprising the steps of

a) propagating the second radiation from the second port to the first port ;

b) deviating the path of the second radiation so as to send it to the fourth port ;

c) sending the third signal radiation from the third port to the fourth port , or vice versa, from the fourth port to the third port ;

d) propagating the first radiation from the first port to the second port ; and
e) reversing the direction of propagation of the first radiation to send it to the fourth port.

27. Method according to claim 26, wherein the common coupling section also comprises a first optical path connecting the first and the second port, and a second optical path (26), in communication with the first optical path (25), connecting the third and the fourth port (23, 24).

28. Method according to claim 27, wherein step a) is carried out by sending the second radiation along the first optical path from the second port to the first port.

29. Method according to claim 28, wherein step b) is carried out by making the second radiation pass from the first optical path to the second optical path.

30. Method according to any claim 25, wherein step c) is carried out by letting the third radiation propagate along the second optical path.

31. Method according to any claim 30, wherein step d) is carried out by sending the first radiation along the first optical path from the first port to the second port.

32. Method according to claim 31, wherein step e) is carried out by making the first radiation pass from the first optical path to the second optical path and back-reflecting it towards the fourth port.